

AMD Projects

Innovate • Transform • Protect

CDC's Advanced Molecular Detection (AMD) program fosters scientific innovation in genomic sequencing, epidemiology, and bioinformatics to transform public health and protect people from disease threats.

AMD Projects: Silencing the 100-day Cough

Using AMD technologies to understand changes in virulence of *Bordetella pertussis* and find effective vaccine components and diagnostic markers

Thought to be a disease of the past, whooping cough (pertussis) has returned with a vengeance. Following a low of about 1,000 cases reported in the 1970s, the disease recently rebounded to between 10,000 and 50,000 reported cases in the United States each year since 2010. Known as the “100-day cough,” pertussis can cause serious illness in people of all ages and can be deadly for babies. The recent increase in this disease is likely because the newer and safer vaccine introduced in the 1990s does not provide long-lasting protection. The pertussis bacteria have also changed over time and this also could be contributing to this unusual situation.

CDC has been working to understand what is driving the reemergence of pertussis. A recent analysis showed that one bacterial component targeted by the vaccine, pertactin, is



CDC and the American Academy of Pediatrics (AAP) recommend that preteens get several vaccines at their 11- or 12-year old check-up, including the tetanus-diphtheria-acellular pertussis vaccine (Tdap).



now missing in at least 9 of every 10 samples collected from people sick with pertussis in the United States. Pertactin, a protein believed to help the bacteria attach to cells in the throat, is one of several components of all pertussis vaccines. Researchers wondered if the bacteria's missing pertactin affects how well the vaccine protects against the disease. To find out, CDC's Pertussis and Diphtheria Laboratory is mapping the complete genome of historical and currently circulating strains of *Bordetella pertussis* to determine if these genetic changes are contributing to the reemergence of whooping cough.

Getting to the bottom of the strain change using advanced molecular detection (AMD) technologies will further CDC's efforts to control pertussis in the United States. The answers can inform development of new pertussis vaccines to help protect people from this illness.

For more information on whooping cough (pertussis), please visit www.cdc.gov/pertussis.



2017 Update

Now in the project's third year, investigators have analyzed *B. pertussis* genomes and confirmed that the types of *B. pertussis* that cause the most illness in the United States are missing pertactin. They continue to look at why these types of *B. pertussis* are more common and why these seem to cause more disease than other types. In the coming year, they will participate in a number of studies to better understand how the bacteria grow, avoid the body's defense system, and react to vaccines.

Investigators continue to characterize *B. pertussis* directly from patient samples with AMD technologies cutting out the step of growing the bacteria first, ultimately saving time and money. Working with Enhanced Pertussis Surveillance (EPS) sites, CDC has been analyzing the genomes of samples from patients and testing to see which antibiotics (medicines that kill bacteria in the body) they are resistant to and if the parts of the bacteria that vaccines target are still there.

Additionally, CDC is working to develop a way for state public health laboratories to use AMD methods in their testing of *B. pertussis* from patient samples. They will also continue to use AMD methods to analyze samples from outbreaks and compare them with historical strains to better understand the evolution of *B. pertussis* and its pattern of genetic changes, information that could help develop new, more effective pertussis vaccines.

